High-Spin Octupole Correlations in the $N = 85$, ^{139}Xe and ^{141}Ba Isotones

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Prompt γ-rays from the fission fragments of ^{252}Cf spontaneous fission were investigated. Data presented in this work from the 1995 Gammasphere measurements of the GANDS95 collaboration [1] were analyzed mainly by Vanderbilt University members of the collaboration. The results of this work were presented in ref. [2].

High-spin states in ^{139}Xe and ^{141}Ba were investigated using gamma-gamma and gamma-gamma-gamma coincidence studies of spontaneous fission of ^{252}Cf. Theoretical calculations [3] and comparison of the odd-even staggering of the differential radii [4] indicate that octupole correlations may occur in ^{139}Xe and ^{141}Ba. On the other hand, some heavier $N = 85$ isotones like ^{145}Nd and ^{147}Sm, have been described as 'quasi-$f_{7/2}$' nuclei. Octupole and 'quasi-$f_{7/2}$' bands are observed in these nuclei. Of particular interest is a new band assigned to have positive parity and based on a $\nu i_{13/2}(f_{7/2})^2$ multiplet in both isotones. The systematics in the $N = 85$ isotones for these 'quasi-$f_{7/2}$' states are presented in Figure 1. Alternating parity bands built on a $7/2^-$ level are assigned up to spin $37/2$ and $29/2$ in ^{139}Xe and ^{141}Xe, respectively. Another possible octupole band with spin up to $29/2$ also is observed in both nuclei. Cascades of enhanced $E1$ transitions and B($E1$)/B($E2$) ratios indicate strong octupole correlations.

References

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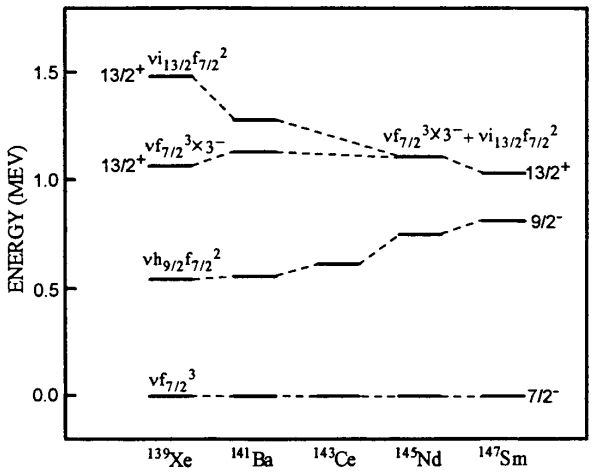

Fig. 1. Level systematics for selected low-lying levels in $N = 85$ isotopes. The level energies are given relative to the first $7/2^+$ state.